

# REFLECTIONS ON THE TAXONOMY AND DISTRIBUTION OF MEDICINAL FLOWERS OF PAKISTAN

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## ABSTRACT

A literature search was conducted to determine the medicinal flowering plants found in Pakistan and used as remedies for various disorders or diseases. The taxonomic position, distribution and flowering period of these plants are described to facilitate their collection at blooming. There are 95 species belonging to 85 genera and 43 plant families. Most of the species belong to Fabaceae and Asteraceae (17 and 13 species respectively), followed by Malvaceae (7 species), Lamiaceae (6 species) and Boraginaceae (4 species). Apocynaceae and Rosaceae contained 3 species each. It is important for the sustainability of Pakistani medicinal plant industry to consolidate the plant-resource database and explore the national and international markets for its medicinal flora. It is imperative that large scale cultivation projects be implemented and that priority species of the medicinal plants be salvaged. Pakistan also needs expanded research efforts into cultivation, production and conservation of medicinal plants. Institutional linkages are urgently needed between all the Pakistani research and development organizations dealing with medicinal and aromatic plants.

## RESUMEN

Se realizó una exhaustiva búsqueda bibliográfica acerca de las angiospermas medicinales de Pakistán utilizadas como remedios contra enfermedades de diversa naturaleza. Se preparó una lista de las especies encontradas con referencia a su posición taxonómica. Se incluye su distribución y período fenológico para facilitar su recolección en el momento óptimo de la floración. El listado comprende un total de 85 géneros y 95 especies pertenecientes a 43 familias. La mayoría de las especies pertenecen a las familias Fabaceae y Asteraceae (17 y 13 especies respectivamente) seguidas de Malvaceae (7 especies), Lamiaceae (5 especies) y Boraginaceae (4 especies); Apocynaceae y Rosaceae presentan 3 especies cada una. Resulta importante para la industria sostenible pakistaní de plantas medicinales consolidar el banco de datos disponibles y explorar los mercados nacionales e internacionales que atañen a su flora medicinal. Es imperativo aumentar los proyectos de cultivos a gran escala y preservar la prioridad de las plantas medicinales. Pakistán necesita también extender los esfuerzos de investigación a los problemas sobre cultivo, producción y conservación de plantas medicinales. Destacamos asimismo la imperiosa necesidad de desarrollar un sistema de transferencia institucional entre la investigación y las organizaciones de desarrollo que intervienen en los procesos industriales de plantas medicinales y aromáticas en Pakistán.

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## INTRODUCTION

The flora of Pakistan is very rich due to the diverse climatic and soil conditions in its different ecological regions. The country has around 6000 species of wild plants; about 400–600 are considered to be of medicinal importance. Pakistan has considerable significance from the point of view of medicinal plants (Nasir et al. 1972) and has been correctly called as the floral emporium of medicinal plants (Rizvi 1998). An estimated 80% of the rural population in Pakistan depends on traditional medicines for their primary healthcare needs, the majority of that are plants or their active principles (Shinwari & Khan 1998).

The sustainable harvesting of medicinal plants has great economic potential. Although some medicinal plants, such as *Carthamus tinctorius*, *Crocus sativus* and *Passiflora edulis*, are locally grown but require knowledge about the proper collection and preservation of these important medicinal plants (Rizvi 1998; William & Ahmad 1999). However, medicinal plants are used both in the indigenous medicinal system and by pharmaceutical industries (Shaheen et al. 2003).

Many different flowering species, such as *Artemisia absinthium*, (Gul-e-afsaantee), *Matricaria chamomilla* (Gul-e-babuna), *Viola odorata* (Gul-e-banafsha), *Rosa damascena* (Gul-e-surkh), and *Crocus sativus* (Gul-e-zafran), are known as potential sources for curing various liver diseases (Bach 1994; Bisset 1994; Duke 1986; Khan et al. 1996). Safflower (*Carthamus tinctorius*) has been used for centuries in Europe and Asia as a laxative and diuretic (Keville 1995). Passionflower (*Passiflora edulis*) is reputed to have anti-spasmodic and sedative properties and used widely as an ingredient in herbal remedies (Reynold et al. 1994). The aqueous extract prepared from the calyx of *Hibiscus sabdariffa* is reported to possess cathartic activity (Haruna 1997).

Classification of medicinal plants is organized in different ways depending on the criteria used. In general, medicinal plants are arranged according to their active principles in their storage organs of plants, particularly roots, leaves, flowers, seeds and other parts of plant (Shaheen et al. 2003). These principles are valuable to mankind in the treatment of diseases (Shaheen et al. 2003; Shinwari & Khan 1998). According to the literature there are many Pakistani medicinal plants (Bach 1994; Nasir & Ali 1972; Rizvi 1998; Shinwari & Khan 1998) that could be used for remedies, medicinal preparations and future utilization (Bach 1994; Bugti 1998; Mahmood et al. 1996; Nasir & Rafiq 1995; Shinwari & Khan 1998; Zaman & Khan 1970). This paper presents the taxonomy of Pakistani medicinal flowering plants, their regional distribution, and flowering periods.

## MATERIALS AND METHODS

A literature search was conducted to find out which Pakistani plants are used as remedies for various disorders or diseases (Bach 1994; Bugti 1998; Duke 1986;

Mahmood et al. 1996; Malik & Farooq 1984; Nasir & Ali 1972; Nasir & Rafiq 1995; Rizvi 1998; Shaheen et al. 2003; Shinwari & Khan 1998; Zaman & Khan 1970). The taxonomic position of species with medicinal properties was determined. Their distribution and flowering period was also noted to facilitate their collection at blooming. The plants included herbs, shrubs, vines and trees. The genera were arranged alphabetically within each family. The nomenclature and classification followed Nasir and Ali (1972), and author citations followed Brummitt and Powell (1992).

#### RESULTS AND DISCUSSION

Ninety-five Pakistani species distributed among 85 genera and 43 plant families were found to have medicinal properties (Table 1). The largest numbers of species were found in Fabaceae and Asteraceae (17 and 13 species respectively), followed by Malvaceae (7 species), Lamiaceae (5 species) and Boraginaceae (4 species). Apocynaceae and Rosaceae each contained 3 species of medicinal plants. Other families contained only one or two species of medicinal plants (Table 1). Their flowering period and distribution were also worked out and presented in Table 1. The medicinal plants that are commercially exploited in large quantities occur mainly in four ecological regions of Pakistan: alpine and high altitude; temperate mountain forests; sub-tropical foothill forests; and arid and semi-arid scrubs (Ali & Qaiser 1986; Shaheen et al. 2003; William & Ahmad 1999).

A number of medicinally important Pakistani plants are found in the moist alpine and high altitude areas, especially in the northwestern valleys (Nasir & Ali 1972; Shaheen et al. 2003; William & Ahmad 1999). Most plants of these areas are slow growing perennial species, which require several years of vegetative growth before reproduction by seed (Shaheen et al. 2003). Some of the species are classified as threatened or vulnerable if the current rate of collection continues. Endangered plant species of this area includes *Podophyllum hexandrum*, *Saussurea costus*, *Picrorrhiza kurrooa*, *Aconitum heterophyllum*, and *Corydalis* sp. (Shaheen et al. 2003). Care should be taken in the conservation of plants with medicinal flowers so that their existence is not threatened.

The origin of Unani (Greek) medicines goes back to the material medica of numerous early civilizations. Unani medicine traces its origin to Greek medicine, which was adopted by the Arabs and thereafter spread to both Europe and Indo-Pak subcontinent (William & Ahmad 1999). There are about 27 large, Pakistani herbal-manufacturing companies, which produce Unani medicines on a commercial scale (Shaheen et al. 2003). The number of herbal-medicine manufacturers in the non-organized sector runs into the hundreds. The annual gross income of some large herbal manufacturers is comparable to that of multinational companies in Pakistan. About 50,000 traditional healers, including homeopaths, are serving about 60% of the population, especially those living in rural areas (Shaheen et al. 2003; William & Ahmad 1999).

TABLE 1. The taxonomy, distribution, and flowering period of some of the medicinal flowers of Pakistan.

Species	Flowering period	Distribution	Medicinal Remedies
<b>MONOCOTYLEDONS</b>			
<b>Poaceae</b>			
<i>Cymbopogon jwarancusa</i> (Jones) Schult.	Jul–Oct	Found in Karachi, Multan, Chitral, NWFP, Quetta, Gilgit	Detoxifier, astringent and tonic
<i>Zea mays</i> L.	Feb–May	Cultivated in Sindh, Punjab, NWFP	Astringent, chloretic, diuretic and remedy for urinary infection
<b>DICOTYLEDONS</b>			
<b>Acanthaceae</b>			
<i>Adhatoda vasica</i> Nees = <i>Justicia adhatoda</i> L.	Feb–Apr	Planted in Karachi, Sindh	Asthma, bronchitis, gonorrhoea, highgrade fever and conjunctivitis
<b>Amaranthaceae</b>			
<i>Achyranthes aspera</i> L.	Sep–Apr	Found in Gilgit, Karachi, Punjab, Baluchistan	Anti-hemorrhoidal
<i>Celosia cristata</i> L. = <i>Celosia argentea</i> L. var. <i>cristata</i> (L.) Kuntze	Oct–Dec	Grown in gardens	Astringent, anti-diarrheal and for irregularity of menstrual cycle
<b>Anacardiaceae</b>			
<i>Mangifera indica</i> L.	Jan–Mar	Grown in Punjab and Sindh	Astringent, urinary infection, catarrh, anti-diarrheal, anti-dysentery, venereal diseases
<b>Apocynaceae</b>			
<i>Catharanthus roseus</i> (L.) G. Don.	Throughout the year	Cultivated and naturalized in the tropics	Asthma, anti-leukemia, eyes salve and flatulence
<i>Pergularia extensa</i> Jacq. = <i>Pergularia daemia</i> (Forssk.) Chiov. var. <i>daemia</i>	Sep–Apr	Found in Karachi, Sindh, Lasbella, Peshawar, Rawalpindi	Anthelmintic, emetic, expectorant
<i>Vinca major</i> L.	Dec–Mar	Found in Parochial, Abbottabad, More hills	Fresh flowers are purgative
<b>Asclepiadaceae</b>			
<i>Calotropis procera</i> (Aiton) W.T. Aiton	Throughout the year	Widely distributed in deserts throughout Pakistan	Asthma, catarrh, cold, cough, cholera, and for dyspepsia
<b>Asteraceae</b>			
<i>Achillea millefolium</i> L.	Aug–Mar	Occurs in Gilgit, Swat, Murree, Poonch, Baluchistan, Chagia	Hypotensive, haemostatic to arrest bleeding
<i>Artemisia absinthium</i> L.	Aug–Sep	Grows in Thandiani	Anthelmintic, anti-scorpion venom and anti-snake venom

TABLE 1. continued

Species	Flowering period	Distribution	Medicinal Remedies
<i>Artemisia maritima</i> L.	Aug–Sep	Found in Astor, Baluchistan, Chitral, Swat	Dyspepsia, tonic and anti-helminthic
<i>Calendula officinalis</i> L.	Dec–Apr	Cultivated in many parks and gardens of Pakistan	Duodenal-gastric ulcers, hypotensive, emmenagogue and cures skin diseases
<i>Carthamus tinctorius</i> L.	Apr–Jul	Distributed NWFP, Baluchistan, (Harnai), Punjab	Emmenagogue, laxative, sedative, stimulant
<i>Chrysanthemum cinerariifolium</i> (Trevir.) Vis.= <i>Tanacetum cinerariifolium</i> (Trevir.) Sch. Bip.	Mar–Jul	Cultivated in Peshawar, Abbottabad	Aperient, conjunctivitis and dyspepsia
<i>Helianthus annuus</i> L.	Jul–Sep	Widely cultivated in Pakistan	Anti-diarrheal, anti-inflammatory carminative, diuretic
<i>Matricaria chamomilla</i> L. = <i>Matricaria recutita</i> L.	Jul–Jan	Found in plains of Punjab, Pishin	Analgesic, antiseptic, carminative, anti-convulsant, diuretic, liver diseases, dyspepsia
<i>Silybum marianum</i> (L.) Gaertn.	Mar–Apr	Found in Lahore, Peshawar, Saidu Sharif, Abbottabad, Mirpur, Rawalpindi	Flower heads are consumed for diabetes control
<i>Tagetes erecta</i> L.	Jun–Nov	Grown in gardens of Pakistan	Anti-dote against wasp stings, cure for eczema, diuretic
<i>Tanacetum gracile</i> Hook.f. & Thomson	Jun–Aug	Found in Hunza, Baluchistan	Anti-helminthic
<i>Taraxacum officinale</i> F. H. Wigg. Group	Feb–Apr	Widely distributed throughout Baluchistan	Aperient, diuretic, stimulant, stomachic, tonic, detoxicant
<i>Xanthium strumarium</i> L.	Jul–Aug	Found in Karachi, Gilgit, Chitral, Baluchistan, Swat, NWFP, Hazara	Flowers useful for tooth-ache
<b>Balsaminaceae</b>			
<i>Impatiens balsamina</i> L.	Jul–Oct	Cultivated in Karachi, Chitral, Murree	Antibiotic activity, intercostal neuralgia and useful in lumbago
<b>Bignoniaceae</b>			
<i>Millingtonia hortensis</i> L.f.	Nov–Mar	Cultivated in Sindh, Punjab	Cures asthma
<i>Stereospermum suaveolens</i> DC. = <i>Stereospermum colais</i> (Buch.-Ham. ex Dillwyn) Mabb.	May–Jun	Occurs in Rawalpindi District	Aphrodisiac, hiccoughs

TABLE 1. continued

Species	Flowering period	Distribution	Medicinal Remedies
<b>Bombacaceae</b>			
<i>Bombax ceiba</i> L.	Dec-Mar	Cultivated as roadside and garden plant in Pakistan	Diuretic and laxative
<b>Boraginaceae</b>			
<i>Arnebia benthamii</i> (Wall. ex G. Don) I.M. Johnston.	Oct-Nov	Found in Makran, Kaghan, Poonch	Angina, fever, pharyngitis
<i>Borago officinalis</i> L.	Jan-Feb	Reproduced from seeds at Karachi	Anti-cancer agent (breast or face), corns, sclerosis and tumors
<i>Onosma hispidum</i> Wall. & G. Don	Mar-Jul	Found in Pishin, common in Landikotal, Swat, Chitral, Kaghan	Cardiac tonic, stimulant
<i>Trichodesma indicum</i> (L.) Sm.	Aug-Oct	Occurs in Mangopir	Flowers used as emulgent and diuretic
<b>Brassicaceae</b>			
<i>Cheiranthus cheiri</i> L.	Mar-May	Cultivated in gardens	Cardiac disorders, emmenagogue, remedy for impotence and paralysis
<i>Erysimum cheiri</i> (L.) Crantz			
<b>Byttneriaceae</b>			
<i>Pterospermum acerifolium</i> (L.) Willd.	Dec-Jul	Cultivated in Islamabad, Peshawar as an introduced tree	Dehydration, otalgia, haematuria, massage
<b>Cannabaceae</b>			
<i>Humulus lupulus</i> L.	Jul-Aug	Found in Pangi on the upper Chenab	Anti-septic, female inflorescence used as diuretic, emmenagogue, dyspepsia
<b>Caprifoliaceae</b>			
<i>Sambucus nigra</i> L.	Mar-Apr	Occurs in Parachinar, Nathiagali, Hazara	Laxative, anti-pruritic and stimulant of blood circulation
<b>Cucurbitaceae</b>			
<i>Trichosanthes dioica</i> Roxb.	Jun-Oct	Found in Punjab, Ravi, Chenab, Doab, Rawalpindi District	Lowers total cholesterol and blood sugar
<b>Fabaceae (Caesalpinioideae)</b>			
<i>Bauhinia purpurea</i> L.	Sep-Nov	Cultivated in Punjab, NWFP, Rawalpindi	Flowers are used as purgative
<i>Bauhinia vanegata</i> L.	Feb-Apr	Cultivated in Pakistan	Flowers are aperient
<i>Caesalpinia pulcherrima</i> (L.) Sw.	Apr-Sep	Cultivated in gardens of Pakistan	Asthma, bronchitis, anti-pyretic, expectorant, anti-malarial
<i>Cassia alata</i> L. = <i>Senna alata</i> (L.) Roxb.	Oct-Dec	Sometimes cultivated in Pakistan	Laxative. Useful in skin texture

TABLE 1. continued

Species	Flowering period	Distribution	Medicinal Remedies
<i>Cassia fistula</i> L.	Apr–May	Naturalized throughout Pakistan. Cultivated in Karachi, Punjab	Cough, diphtheria, laxative, edema
<i>Cassia siamea</i> Lamk = <i>Senna siamea</i> (Lam.) H. S. Irwin & Barneby	Oct–Dec	Cultivated in Karachi, Sindh	Anthelmintic, anti-hypertensive, asthma, dandruff, insomnia, laxative, tranquilizer, sedative
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	May–Jun	Planted in Karachi, Hyderabad, Lahore	Anthelmintic
<i>Tamarindus indica</i> L.	Feb–Apr	Grown in Sindh, Punjab, Jhelum, Karachi	Anti-viral against New Castle disease virus, astringent and sedative
<b>Fabaceae (Mimosoideae)</b>			
<i>Acacia nilotica</i> (L.) Delile	May–Jun	Found cultivated or wild in Sindh, Punjab, Baluchistan, NWFP	Useful in jaundice and palpitations
<i>Albizia lebbek</i> (L.) Benth	Jul–Oct	Grows in Sialkot to Hajara, Bajaur, Malakand	Aperient, boils, carbuncle, antibacterial
<i>Prosopis cineraria</i> (L.) Druce	Apr–Jul	Found in Sindh, Baluchistan, Punjab (in Thal and Cholistan deserts)	Beneficial against miscarriage
<b>Fabaceae (Papilionoideae)</b>			
<i>Butea frondosa</i> Roxb. = <i>Butea monosperma</i> (Lam.) Taub.	Mar–Apr	Cultivated in Punjab, NWFP	Anti-pyretic, appetizer, aphrodisiac, blood purifier, diuretic, tonic, viral hepatitis
<i>Butea monosperma</i> (Lam.) Taub.	Mar–Apr	Cultivated in Punjab, NWFP	Astringent, aphrodisiac, boil depurative, diuretic, gout, anti-leprosy agent
<i>Pongamia pinnata</i> L. = <i>Milletia pinnata</i> (L.) Panigrahi	Apr–May	Cultivated in Sindh, Punjab	Flowers are used in diabetes
<i>Sesbania grandiflora</i> (L.) Pers.	Aug–Mar	Planted in Karachi, Kutch, Sindh, Punjab	Flower juice improves vision (as eye drops)
<i>Sesbania sesban</i> (L.) Merr.	Apr–Nov	Found cultivated and wild in Sindh, Punjab	Anti-fertility activity reported
<i>Trifolium pratense</i> L.	Feb–Apr	Occurs in Chitral, Astor, Swat, Hazara	Anti-asthmatic, anti-spasmodic, bronchitis and expectorant
<b>Iridaceae</b>			
<i>Crocus sativus</i> L.	Oct	Propagated by bulb in Baluchistan	Beneficial for liver, brain, heart, regulates the menstrual function

TABLE 1. continued

Species	Flowering period	Distribution	Medicinal Remedies
<b>Lamiaceae</b>			
<i>Hyssopus officinalis</i> L.	Jun-Sep	Cultivated in Kashmir, Pangi, Upper Chenab	Used for chest congestion, flower tea is expectorant
<i>Leucas aspera</i> (Willd.) Link	Aug-Feb	Found in Jammu, Ghat, Ravi, Chenab, Doab	Anti-tussive, decongestant for children
<i>Mentha longifolia</i> (L.) Huds.	Feb-May	Common in home gardens	Carminative and stimulant
<i>Ocimum basilicum</i> L.	Nov-Apr	Cultivated in Karachi, Baluchistan, Punjab	Decongestant
<i>Pervoskia abrotanoides</i> Kar.	Sep-Oct	Occurs in Baluchistan, Chitral, Gilgit, Hunza, Quetta, Ziarat	Anti-pyretic
<b>Linaceae</b>			
<i>Linum usitatissimum</i> L.	Feb-Apr	Cultivated in Karachi	Cardiac and nerve tonic
<b>Lythraceae</b>			
<i>Lawsonia inermis</i> L.	Jun	Found in Sindh, Baluchistan, Punjab	Anti-pyretic, sedative, soporific
<b>Magnoliaceae</b>			
<i>Michelia champaca</i> L.	Throughout the year	Cultivated in Punjab, NWFP	Used in dyspepsia, anti-pyretic, anti-emetic
<b>Malvaceae</b>			
<i>Abutilon indicum</i> (L.) Sweet	Feb-Mar	Widely distributed in Karachi, Sindh, lower hills of Punjab	Anti-diarrheal, demulcent, anti-hemoptysis, sedative and decongestant
<i>Aithaea officinalis</i> L.	Jul-Oct	Grows in Azad Kashmir, Peshawar, Rawalpindi	Emollient, demulcent, diuretic, bronchial catarrh and rheumatism
<i>Gossypium herbaceum</i> L.	May-Jul	Cultivated as a crop in Punjab and Sindh	Extracted flowers used as abortifacient and for inducing menstrual flow
<i>Hibiscus cannabinus</i> L.	Autumn-Winter	Cultivated in Sindh, Karachi, Swat, Punjab, Chitral	Gastritis and popular laxative
<i>Hibiscus rosa-sinensis</i> L.	Apr-Sep	Grown as ornamental plant in Punjab, Sindh	Cardiac tonic, expectorant, anti-pyretic, anti-tussive, decongestant
<i>Hibiscus sabdariffa</i> L.	Aug-Sep	Cultivated in Karachi	Cathartic activity
<i>Urena lobata</i> L.	Sep-Dec	Occurs in Lahore, Jehlum, Changa Manga	Aphthosis, expectorant, decongestant
<b>Meliaceae</b>			
<i>Azadirachta indica</i> A. Juss	Mar-Apr	Found in Sindh, southern Punjab, lower Baluchistan	Adrenalgic stimulant, dyspepsia, also used in skin diseases
<i>Melia azedarach</i> L.	Mar-May	Found in Sindh and Punjab	Poultice to relieve headache, nervousness



TABLE 1. continued

Species	Flowering period	Distribution	Medicinal Remedies
<b>Moringaceae</b> <i>Moringa oleifera</i> Lam.	Feb-Apr	Cultivated in Rawalpindi, planted in Sindh	Cholagogue, diuretic tonic
<b>Musaceae</b> <i>Musa sapientum</i> L. = <i>Musa ×paradisica</i> L.	Feb-Sep	Cultivated in Sindh, Punjab, NWFP	Anti-hypoglycemic
<b>Myrtaceae</b> <i>Myrtus communis</i> L.	Apr-Jun	Wild in Baluchistan, NWFP	As anti-septic, disinfectant
<b>Nyctaginaceae</b> <i>Mirabilis jalapa</i> L.	Nov-Jan	Found in Karachi, NWFP, Hunza, Gilgit	Anti-hemorrhoidal
<b>Nymphaeaceae</b> <i>Nelumbo nucifera</i> Gaertn.	May-Jul	Found in Charsada, Multan, Shahdara	Cardiac tonic, diuretic, anti-pyretic
<b>Oleaceae</b> <i>Jasminum grandiflorum</i> L.	Warm season	Occurs in Peshawar, Karachi	Aphrodisiac, astringent, carminative, dysentery, hepatitis, suppress excess lactation
<i>Jasminum sambac</i> (L.) Aiton	Jul-Oct	Occurs in Karachi, Lahore, Islamabad	Anti-pyretic, cardiac tonic, lactifuge
<b>Paeoniaceae</b> <i>Paeonia emodi</i> Wall. ex Royle	May-Jun	Common in moist ground, Kaghan, Thandiani, Chitral, Bahrin, Poonch	Anti-diarrheal
<b>Papaveraceae</b> <i>Papaver rhoeas</i> L.	Jun-Sep	Cultivated in gardens	Bronchitis, hoarseness, sedative, sudorific
<b>Passifloraceae</b> <i>Passiflora incarnata</i> L.	Jul-Sep	Cultivated in Karachi	Asthma, dysentery, insomnia, whooping cough
<b>Pontederiaceae</b> <i>Eichhorina crassipes</i> (Mart.) Solms	Apr-Jul	Occasionally found filling ponds in plains	Arthritis and gout
<b>Punicaceae</b> <i>Punica granatum</i> L.	May-Jun	Commonly grown in Quetta, Sibbi, Karachi, Punjab, NWFP	Anti-diarrheal, dysentery, bronchitis

TABLE 1. continued

Species	Flowering period	Distribution	Medicinal Remedies
<b>Rosaceae</b>			
<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Jul-Aug	Cultivated in sub-Himalayan zone	Flowers are expectorant
<i>Rosa × damascena</i> Mill.	Jan-Jul	Cultivated in gardens of Pakistan	Anti-HIV, aperient, cardio-active, liver protector
<i>Rosa foetida</i> Herrm.	Jan-Jul	Found in Baluchistan, Kurrum, Quetta, Ziarat	Anti-diarrheal
<b>Sapotaceae</b>			
<i>Bassia latifolia</i> Roxb. = <i>Madhuca longifolia</i> (L.) J.F. Macbr.	Jul-Aug	Cultivated in Sindh, Punjab	Regarded as bronchitis, cooling, cold, anti-tussive, demulcent and tonic
<b>Scrophulariaceae</b>			
<i>Verbascum thapsus</i> L.	Jun-Aug	Common in Chitral, Mansehra	Coughs, diarrhea, febrifuge, stimulant, pharyngitis
<b>Solanaceae</b>			
<i>Datura metel</i> L.	May-Jun	Weedy places, Karachi	Smoke as anti-asthma
<i>Solanum surattense</i> Burm. f. = <i>Solanum virginianum</i> L.	Jun-Nov	Throughout Pakistan	Paresthesia, carminative
<b>Rubiaceae</b>			
<i>Ixora coccinea</i> L.	Jul-Jan	Cultivated in Karachi	Cure sores, relieve blood, ulcers
<b>Tropaeolaceae</b>			
<i>Tropaeolum magus</i> L.	Dec-Feb	Cultivated in Karachi	Natural anti-biotic
<b>Verbenaceae</b>			
<i>Nyctanthes arbor-tristis</i> L.	Aug-Oct	Naturalized in Punjab, Rawalpindi, NWFP, Mardan	Anti-pyretic, faintness, anti-vertiginous
<i>Vitex negundo</i> L.	Mar-Jun	Cultivated in Thai, Swat, Mirpur	Cardio tonic, cholera, diarrhea, useful for liver disorders
<b>Violaceae</b>			
<i>Viola odorata</i> L.	Mar-May	Naturalized in Nathia gali, Hazara, Kaghan, Swat, Chital	Liver protector, decongestant

Pakistan has the potential for sustainable utilization of its medicinal flora. Basic infrastructure also exists to carry out research and development activities in this field. However, more attention needs to be paid to the systematic propagation, collection and conservation of medicinal plants. It is important that the country consolidates its plant-resource database, explores the interna-

tional and national markets for its medicinal flora, and implements large scale cultivation projects and salvage projects for its more important medicinal-plant species. Pakistan needs an expansion of research efforts into cultivation, production and conservation of medicinal plants. There is also a dire need to develop a system of institutional linkages among all the research and development organizations dealing with the Pakistani medicinal and aromatic plant industry.

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